

**What is claimed is**

1. A programmable circuit configurator having an interface for coupling to a target circuit device and having dedicated test-signal circuitry for testing a configured circuit (110) that includes the target circuit device, the programmable circuit configurator comprising:

routing circuitry (115) having configurable test signal routing paths with controllable switches therein for coupling test signals between the dedicated test-signal circuitry and the target circuit device via the interface;

a programmable microcontroller (120) communicatively coupled to the routing circuitry, the microcontroller being programmed to control the controllable switches and thereby configure the test signal routing paths; and

a communications link (130) adapted to communicatively couple an external user-controlled device (140) and the programmable microcontroller for passing reconfiguration-control signals to the programmable microcontroller and for reporting characteristics of the configured test signal routing paths, the reconfiguration-control signals being communicatively coupled to the programmable microcontroller for reconfiguring the test signal routing paths.

2. The programmable circuit configurator of claim 1, wherein the dedicated test-signal circuitry includes a test-data input port adapted to pass test data to the dedicated test-signal circuitry, a test-data output port adapted to pass test data from the dedicated test-signal circuitry, and a test-clock port.

3. The programmable circuit configurator of claim 1, wherein the microcontroller is programmed to control and monitor a plurality of operational characteristics of the configured circuit.

4. The programmable circuit configurator of claim 1, wherein the configured circuit includes a plurality of JTAG signal path switches adapted to route JTAG signals on the configured circuit and between the configured circuit and other configured circuits coupled to the configured circuit, and wherein the

microcontroller is programmed to configure the plurality of JTAG signal path switches.

5. The programmable circuit configurator of claim 4, wherein the microcontroller is programmed to switch the plurality of JTAG signal path switches in response to the reconfiguration-control signals received at the user-controlled device and sent to the microcontroller via the communications link.

6. The programmable circuit configurator of claim 1, wherein the microcontroller is separably operable from the configured circuit and programmed to monitor operational characteristics of the configured circuit prior to power-up of the configured circuit.

7. The programmable circuit configurator of claim 6, wherein the microcontroller is programmed to monitor and configure the position of JTAG signal path switches on the configured circuit when the configured circuit is not powered.

8. The programmable circuit configurator of claim 7, wherein the microcontroller is programmed to set the position of the JTAG signal path switches when the configured circuit is not powered.

9. The programmable circuit configurator of claim 1, wherein control inputs from the user-controlled device are stored in memory at the programmable circuit configurator and wherein the microcontroller is programmed to configure the test signal path switches using the control inputs stored in the memory.

10. The programmable circuit configurator of claim 1, wherein the microcontroller is programmed to perform diagnostic testing on the configured circuit when the configured circuit is not powered.

11. The programmable circuit configurator of claim 10, wherein the microcontroller is programmed to send information obtained from the diagnostic testing to a user via the communications link and the user-controlled device.

12. A hardware configurator arrangement comprising:

- a configured circuit (110) having a plurality of controllable switches (115) communicatively coupled between at least two JTAG test nodes (112, 116) on JTAG signal paths and target circuit devices along the JTAG signal paths;
- a programmable microcontroller (120) communicatively coupled to the configured circuit, programmed to monitor and control a plurality of operational characteristics of the configured circuit including the controllable switches and adapted to output data in response to the monitored operational characteristics;
- a user interface (140) adapted to accept control inputs from a user and to provide the output data from the microcontroller to the user;
- a communications link (130) configured and arranged to communicate the control inputs and the microcontroller output data between the microcontroller and the user interface; and
- the microcontroller being programmable by the control inputs received from the user interface and communicated via the communications port for monitoring and controlling the plurality of operational characteristics of the microcomputer arrangement, including controlling the controllable switches for coupling test signals to the target circuit devices.

13. The hardware configurator arrangement of claim 12, wherein the microcontroller is programmed to automatically detect a test signal at one of the JTAG test nodes and, in response to an automatically detected test signal, to control the controllable switches to route data between at least one of the JTAG test nodes and at least one of the JTAG signal paths.

14. The hardware configurator arrangement of claim 13, wherein the microcontroller is programmed to monitor the JTAG test nodes using an interrupt routine for automatically detecting test signals at the JTAG test nodes.
15. The hardware configurator arrangement of claim 12, wherein the microcontroller is programmed to control the controllable switches for routing JTAG test data between the configured circuit and another configured circuit.
16. The hardware configurator arrangement of claim 15, wherein said configured circuit is coupled to said other configured circuit such that physical access to the controllable switches is prevented.
17. The hardware configurator arrangement of claim 12, wherein the microcontroller is adapted to control operation of the configured circuit in response to control inputs from the user interface.
18. The hardware configurator arrangement of claim 12, wherein the microcontroller is adapted to control JTAG operation of the configured circuit in response to control inputs from the user interface.
19. For use in a prototype arrangement of inter-connectable circuit boards, each of the inter-connectable circuit boards having JTAG test signal routing switches (801, 801), JTAG test nodes (830, 834) and at least two JTAG circuit paths, a configurator server comprising:
  - a memory (845) adapted to store data including program software;
  - a reprogrammable microcontroller (840) on a first one (800) of the inter-connectable circuit boards and communicatively coupled to the memory, the microcontroller being programmed to automatically configure the JTAG test signal routing switches in response to a signal detected from at least one of the JTAG test nodes for routing JTAG test signals along a JTAG circuit path on at least the first

one of the inter-connectable circuit boards using data stored in the memory including the program software; and

a communications link (848) adapted to communicate control inputs from a user interface device to the microcontroller and to communicate outputs from the microcontroller to the user interface, the microcontroller being operable in response to the control inputs.

20. The configurator server of claim 19, wherein the microcontroller is programmed to control the data-routing switch arrangement for routing JTAG test signals between two of the inter-connectable circuit arrangements.

21. The configurator server of claim 19, wherein the microcontroller is adapted to set the JTAG test signal routing switches in response to the control inputs received from the user interface.

22. The configurator server of claim 19, wherein the microcontroller is programmed to perform an interrupt routine for detecting the signal from the at least one of the plurality of test nodes.

23. The configurator server of claim 19, wherein each of the inter-connectable circuit arrangements includes at least one JTAG input test node and at least one JTAG output test node and wherein the JTAG output test node of the first one of the inter-connectable circuit arrangements is coupled to a JTAG input test node of a second one of the inter-connectable circuit arrangements and wherein the microcontroller is programmed for automatically configuring the JTAG test signal routing switches to route JTAG test signals between the first and second inter-connectable circuit arrangements via the JTAG output and JTAG input test nodes.

24. A programmable circuit configurator having an interface for coupling to a target circuit device and having dedicated test-signal circuitry for testing a

configured circuit (110) that includes the target circuit device, the programmable circuit configurator comprising:

routing means (115) having configurable test signal routing paths with controllable switches therein for coupling test signals between the dedicated test-signal circuitry and the target circuit device via the interface;

programmable controlling means (120) communicatively coupled to the routing circuitry, the programmable controlling means being programmed to control the controllable switches and thereby configure the test signal routing paths; and

communications means (130) adapted to communicatively couple an external user-controlled device (140) and the programmable controlling means for passing reconfiguration-control signals to the programmable controlling means and for reporting characteristics of the configured test signal routing paths, the reconfiguration-control signals being communicatively coupled to the programmable controlling means for reconfiguring the test signal routing paths.

25. A method for configuring an electronic circuit having an interface for coupling to a target circuit device and having dedicated test-signal circuitry for testing a configured circuit (110) that includes the target circuit device, the method comprising:

using routing circuitry (115) having configurable test signal routing paths with controllable switches therein to couple test signals between the dedicated test-signal circuitry and the target circuit device via the interface;

programming a programmable microcontroller (120) communicatively coupled to the routing circuitry to control the controllable switches and thereby configure the test signal routing paths; and

communicatively coupling an external user-controlled device (140) via a communications link (130) to the programmable microcontroller and passing reconfiguration-control signals to the programmable microcontroller and reporting characteristics of the configured test signal routing paths, the reconfiguration-control signals being communicatively coupled to the programmable microcontroller to reconfigure the test signal routing paths.